

PHYSIOLOGICAL AND STRUCTURAL FOLIAR CHARACTERISTICS OF FOUR CENTRAL PENNSYLVANIA BARRENS SPECIES IN CONTRASTING LIGHT REGIMES

Brian D. Kloeppel, Mark E. Kubiske, and Marc D. Abrams¹

Abstract: Four central Pennsylvania barrens species, black oak (*Quercus velutina*), chestnut oak (*Quercus prinus*), red maple (*Acer rubrum*), and sassafras (*Sassafras albidum*), in the sapling size range were tagged and monitored in juxtaposed understory and full sunlight conditions. Five times during the 1990 growing season diurnal gas exchange measurements were collected along with stomatal and tissue leaf structure on all species in both light regimes. Concurrently, tissue pressure-volume (P-V) analysis and soil moisture analysis were conducted to compare inter-site and inter-species water relations parameters. One sampling date was conducted at the end of a mild drought period to determine if adjustments had occurred in water relations parameters. Leaf structure data indicated that guard cell length and stomatal density were fixed over the growing season, but differences existed between the contrasting light regimes. Also, the full sunlight treatment leaves were relatively thicker than the understory leaves. Species diurnal gas exchanges measurements were similar within light regimes, but differences in species diurnal patterns existed. Sassafras usually peaked soon after full sunlight conditions existed and then tailed-off markedly; whereas all three other species reached a plateau in mid-morning and maintained moderate levels of net photosynthesis during the afternoon. Soil moisture did not decrease to drought conditions at anytime during the growing season. However, the fourth diurnal measurement on August 3, 1990 showed a 50% decrease in soil moisture to 6%. This decrease in soil moisture did not significantly affect pre-dawn leaf water potentials or the calculated parameters from the P-V analysis. However, the P-V analysis did show the high capacitance and relatively high wilting point exhibited by sassafras compared to the other three species.

¹Graduate Assistants and Assistant Professor, respectively, Pennsylvania State University, School of Forest Resources, 101 Ferguson Building, University Park, PA 16802